SERVING AREA VALUE ENGINEERING (PHYSICAL PLANT)

CONTENTS

1. GENERAL

1.1 The physical construction practices associated with the installation of the SAVE systems are basically in accordance with TE&CM 641, "Construction of Buried Plant Plant" and TE&CM 642, "Staking of Buried Plant"; REA Form 511a, "Specifications and Drawings for Construction of Buried Cables and Wires"; and the REA Splicing Standard PC-2. This section introduces guidelines and recommendations for outside plant facilities used in the Serving Area Value Engineering (SAVE) method for designing rural telephone systems. REA TE&CM Section 230, "General Principles of Serving Area Value Engineering", Section 231, "Design Techniques of Serving Area Value Engineering", Section 232, "Transmission Design Considerations of Serving Area Value Engineering" and TE&CM Section 629, "Cable Plant Layout-Serving Area Value Engineering for Rural Systems", describe the concept.

1.2 This section introduces the Serving Area Interface (SAI) for use in REA borrowers systems. The SAI is the interconnection point between the feeder circuits from the Central Office and the distribution pairs from subscribers within the Serving Area.

1.3 The function of the Serving Area Interface (SAI) housing may be to provide the capacity needed for the placement and termination of electronic equipment and the feeder and distribution cables as required for that particular serving area for an average serving life of 25 years. By need, therefore, the size and internal components of the housing must be so designed to provide adaptation to the various manufacturers' component equipment, the necessary splicing and cross-connecting with testing access to provide for the operational function of the SAVE system. In addition, the housing must also provide physical environmental protection to

eliminate the problems associated with blowing snow, dirt, dust, insects, rodents, heat and ultra-violet light.

1.4 The Engineer should give consideration to the degree of installer activity anticipated at each SAI before deciding upon the type of internal components to be placed within the housing. The majority of SAI locations will generally have less than 25 feeder pairs assigned initially and anticipated to serve a respective serving area - this condition should be considered by the Engineer as a Low Activity Serving Area Interface location. A High Activity SAI location would be where there is needed more than 25 feeder pairs initially and where it is expected that the number of feeder pairs will continue to increase. A condition such as this would generally be relatively close to a town area and usually at sub-divisions or land-development locations.

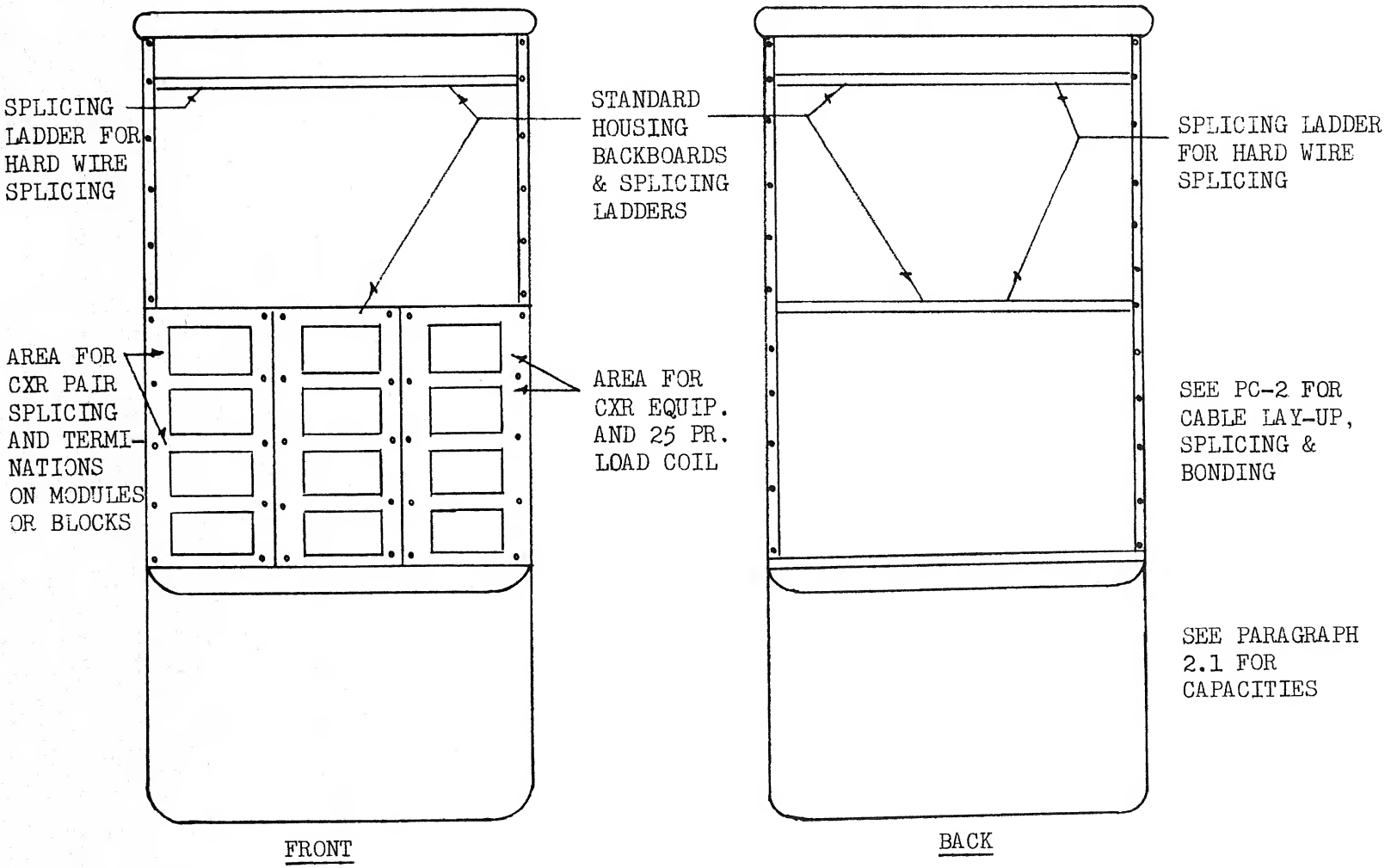
1.5 At SAI Low Activity locations, consideration should be given to the use of the conventional hard wire splicing with distribution pairs spliced directly to feeder pairs. It is suggested that carrier pairs from both the central office and carrier terminal VF drops be spliced with splice modules or blocks and positioned as indicated in the drawings on pages 3, 4, and 5.

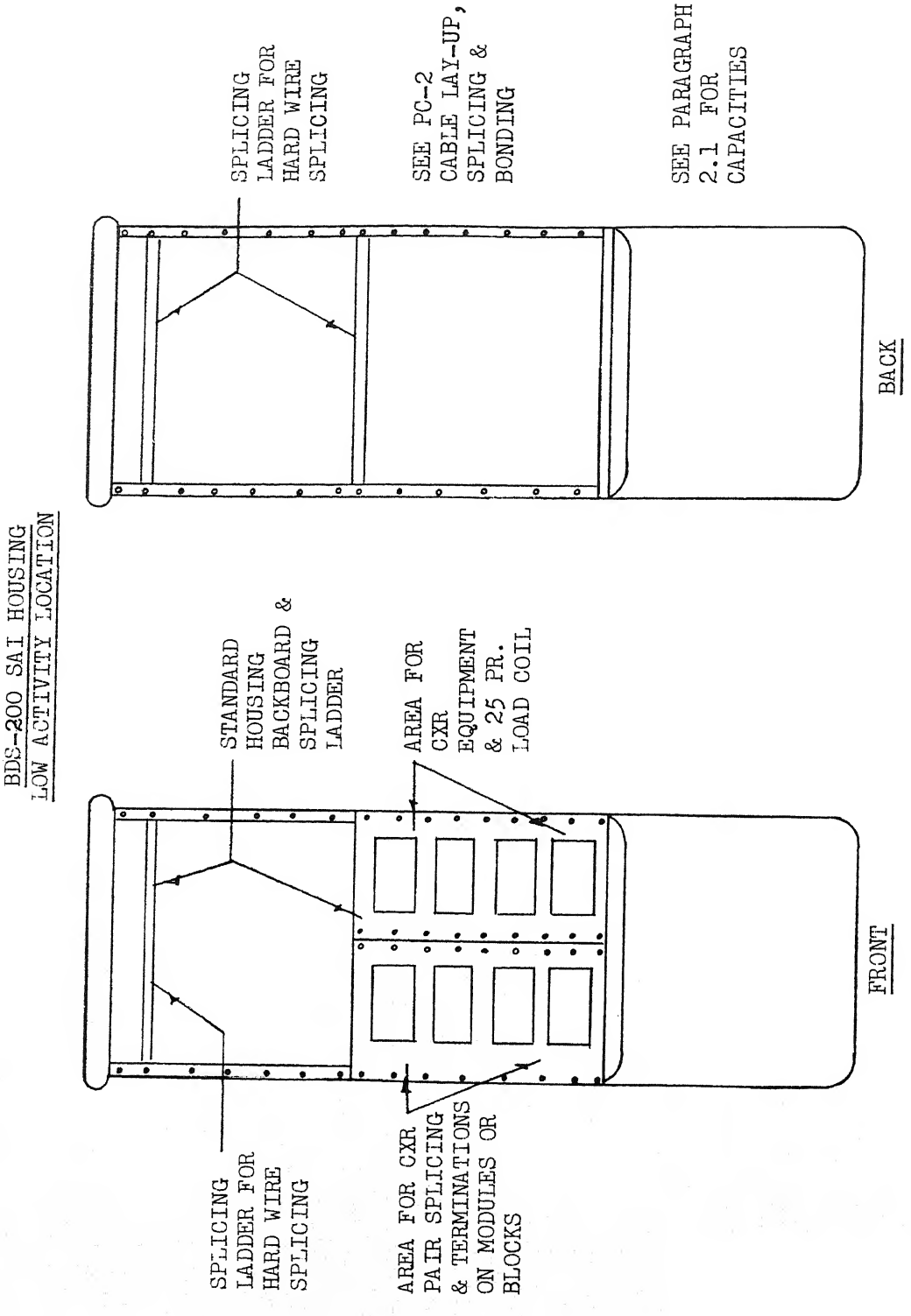
1.6 At SAI High Activity locations where there are 25 or more feeder pairs assigned for distribution, consideration should be given to the use of 25 pair feeder and distribution cross-connect modules or blocks for the termination of the feeder assigned pairs and termination of the distribution cable(s). In addition, it is suggested that the carrier pairs from the central office and electronic equipment be spliced with splice modules or blocks as shown in the drawings on pages 6, 7 and 8. It generally will not be necessary to provide splice rack mounts for placement of splicing modules or blocks except where in the Engineer's judgement that good housekeeping, because of very large size cable, is necessary.

1.7 Consideration should be given to the direct burial of load coils when more than 25 pairs are to be loaded at either the low activity or high activity SAI locations.

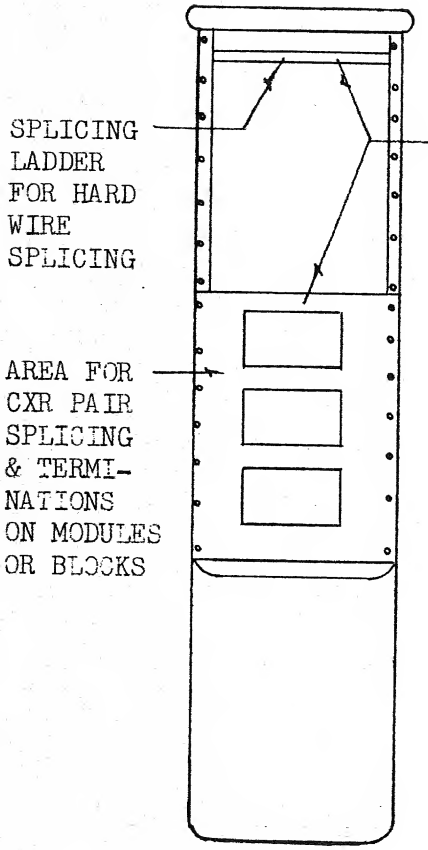
1.8 As will be indicated by the values obtained from the SAVE design, the sizing and assignments of the feeder and distribution cables and the physical components to be placed will determine the particular size of the physical cabinet or housing that will be required at a particular location.

BDS-300 SAI HOUSING
LOW ACTIVITY LOCATION




BDS-200 SAI HOUSING
LOW ACTIVITY LOCATION
SPLICING LADDER FOR HARD WIRE SPLICING
SEE PC-2 CABLE LAY-UP, SPLICING & BONDING
SEE PARAGRAPH 2.1 FOR CAPACITIES
BACK
STANDARD HOUSING BACKBOARD & SPLICING LADDER
AREA FOR CXR EQUIPMENT & 25 PR. LOAD COIL
FRONT
SPLICING LADDER FOR HARD WIRE SPLICING
AREA FOR CXR PAIR SPLICING & TERMINATIONS ON MODULES OR BLOCKS

BDS-100 SAI HOUSING
LOW ACTIVITY LOCATION

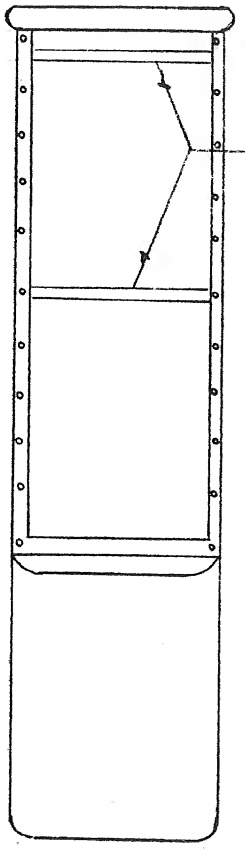


SPLICING LADDER FOR HARD WIRE SPLICING

AREA FOR CXR PAIR SPLICING & TERMINATIONS ON MODULES OR BLOCKS

STANDARD HOUSING BACKBOARD AND SPLICING LADDERS

FRONT



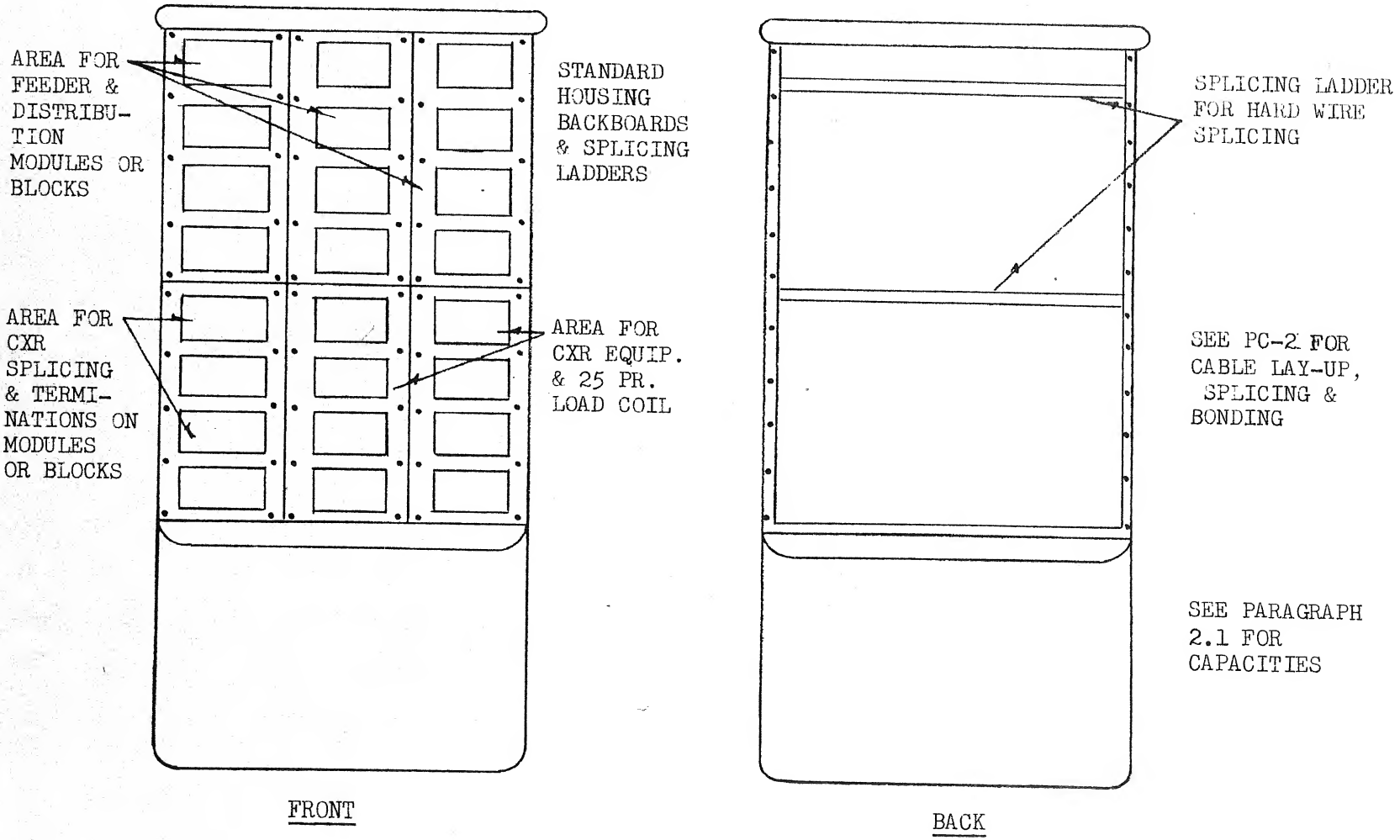
SPLICING LADDER FOR HARD WIRE SPLICING

SEE PC-2 FOR CABLE LAY-UP, SPLICING & BONDING

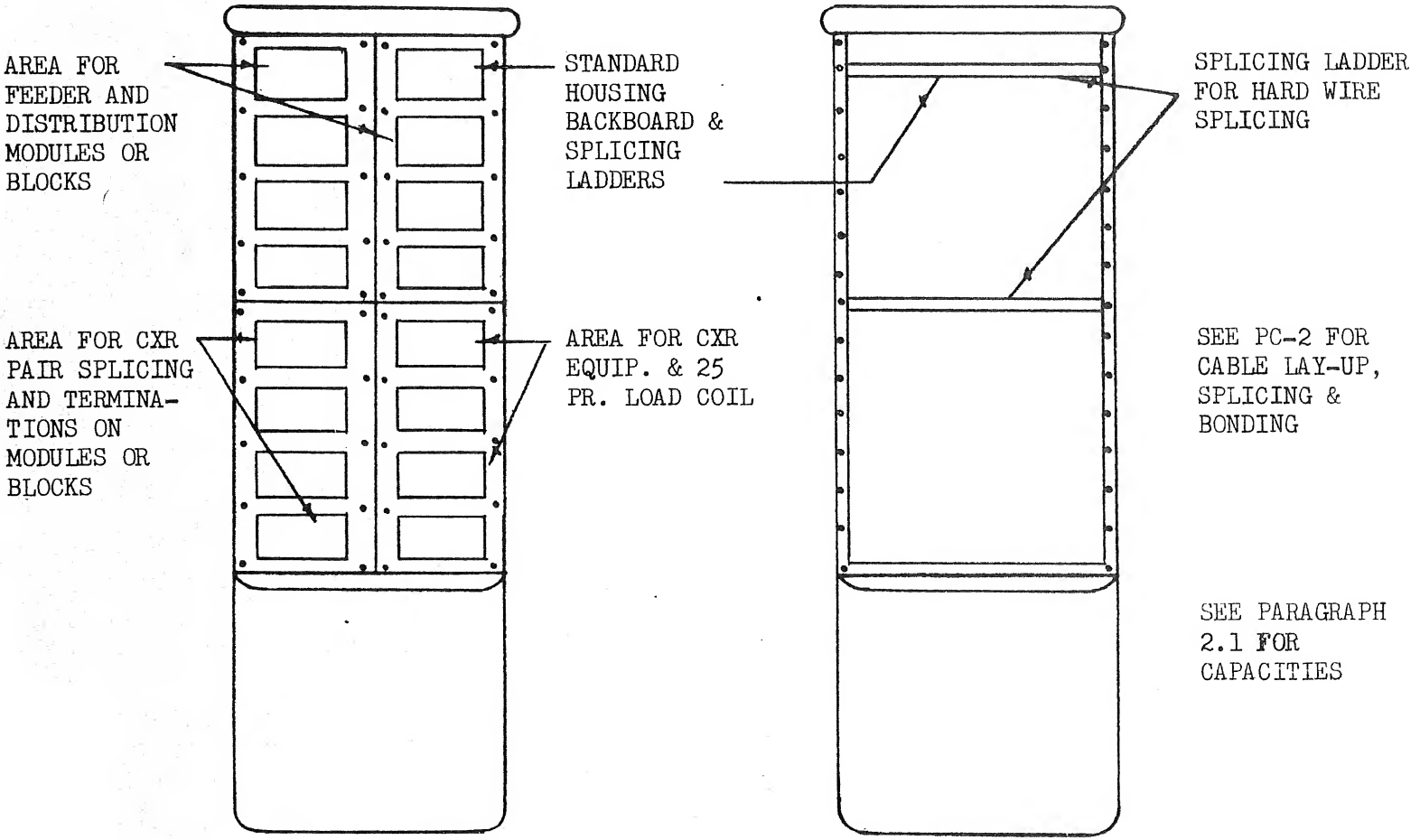
SEE PARAGRAPH 2.1 FOR CAPACITIES

BACK

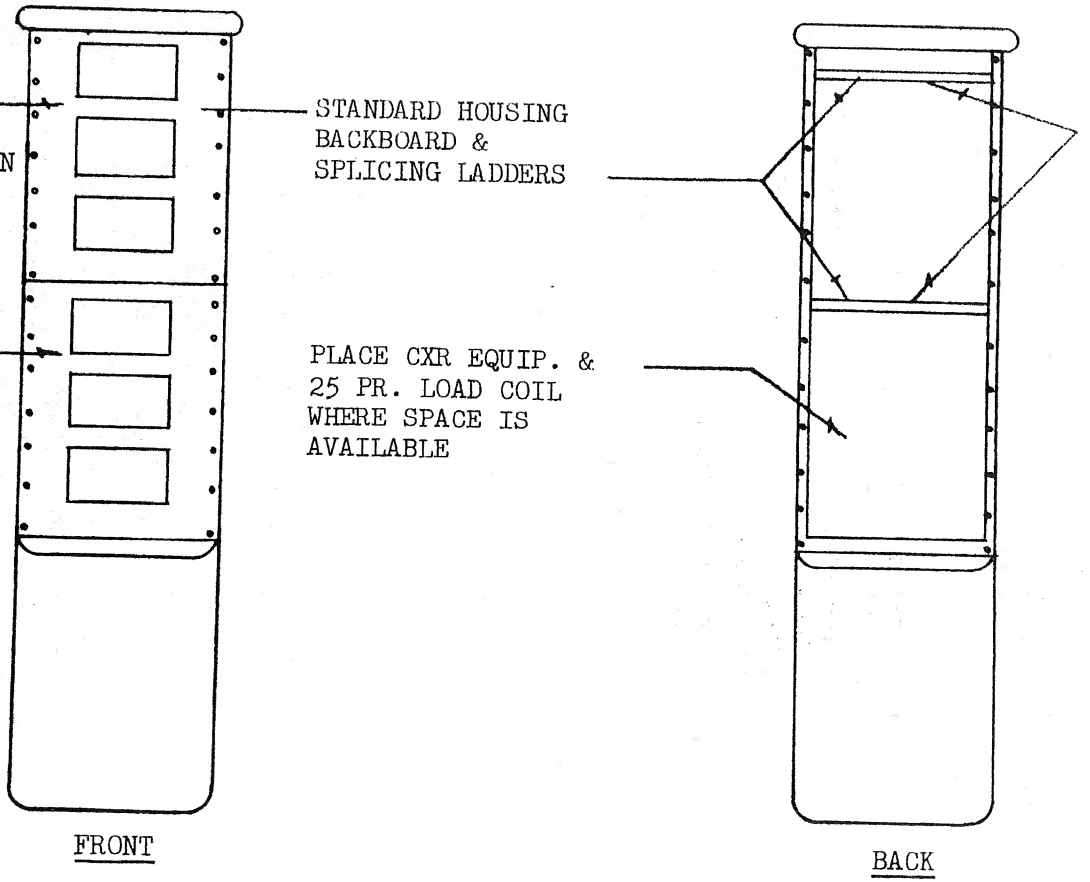
BDS-300 SAI HOUSING
HIGH ACTIVITY LOCATION



BDS-200 SAI HOUSING
HIGH ACTIVITY LOCATION



BDS-100 SAI HOUSING
HIGH ACTIVITY LOCATION



2. HOUSING CABINETS

2.1 The basic SAI housings or cabinets considered necessary to support the operational function of the SAVE system are as follows:

BDS-100	Buried Cable and Wire Housing
BDS-200	Buried Cable and Wire Housing
BDS-300	Buried Cable and Wire Housing

The following modifications using suffixes apply to the buried wire and cable housings:

Suffix

A.- Indicates pole mount for use with the BDS-100 or BDS-200 housing.
F - Indicates a concrete slab for use with the BDS-200 or BDS-300 housing.
P - Indicates a plastic pad for use with the BDS-100, BDS-200 or BDS-300 housing.
R - Indicates a crushed stone or gravel bed for use with the BDS-100, BDS-200 or BDS-300 housing.
S - Indicates a stake mount for use with the BDS-100, BDS-200 or BDS-300 housing.

2.2 A guideline to the general capacities of the SAI housings are as follows:

Housing Designation	No of pairs using 25 pr. splice or x-connect modules	No. of pairs using mechanical splice connector	No. of 25 pr. load coils mounted within	No. of CXR channel equipment
BDS-300 (High Activity)	900	1000	0	1 to 8
BDS-300 (Low Activity)	150	1600	0	1 to 8
BDS-300 (High Activity)	900	900	1	1 to 8
BDS-300 (Low Activity)	150	1500	1	1 to 8
BDS-200 (High Activity)	450	600	0	1 to 5
BDS-200 (Low Activity)	150	900	0	1 to 5
BDS-200 (High Activity)	450	500	1	1 to 5
BDS-200 (Low Activity)	150	800	1	1 to 5
BDS-100 (High Activity)	250	400	0	1 to 3
BDS-100 (Low Activity)	125	600	0	1 to 3
BDS-100 (High Activity)	250	300	1	1 to 3
BDS-100 (Low Activity)	125	500	1	1 to 3

2.3 Suitable electronic equipment may be installed within the housing where space is available. REA will indicate in the List of Materials what type of electronic equipment is satisfactory for installation in a particular manufacturer's housing.

3. INTERNAL CABINET BRACKETING

3.1 The housing manufacturer of the Serving Area Interface housings (SAI) shall provide the internal bracketing for the mounting of specific system components (splices and cross-connect modules or blocks) or splicing ladders etc., for hard wire (mechanical splice connector) splicing. It is of major importance that the Engineer designate only one manufacturer's system components for a particular SAVE project. This is necessary to eliminate confusion in installation and in the operational functions.

4. SPLICING COMPONENTS

4.1 The basic physical splicing components for the SAVE system are as follows:

4.11 The splice modules or block will generally be a 25-pair splice connector with individual pair test facilities and provisions for bridge splicing and conductor transfers.

4.12 The feeder cross-connect modules or blocks will generally be of a 25-pair capacity with individual pair test facilities and provisions for cross-connect jumpering. The feeder cross-connect module or block is capable of terminations of feeder cable(s), load coil lead-out conductors, and for placing jumper wire to the distribution cross-connect modules or blocks. The color green has been designated to identify the feeder cross-connect module or block.

4.13 The distribution cross-connect module or block is also generally of a 25-pair capacity with individual pair test facilities and provisions for cross-connect jumpering. The distribution cross-connect module or block is capable of terminating distribution cables and for placing jumper wire to the feeder module or blocks. The color blue has been designated to identify the distribution module or block.

4.14 The color yellow has been designated for splice or cross-connect modules or blocks used for carrier pair terminations.

5. INSTALLATION PROCEDURES

5.1 As indicated in paragraph 1.1, the installation practices for the placement of cable are contained in TE&CM 641, "Construction of Buried Plant", TE&CM 642, "Staking of Buried Plant", REA Form 511a, "Specifications and drawings for Construction of Buried Cables and Wires", and the REA Splicing Standard PC-2. All terminations to be made within the interface housings should be determined from the TE&CM 629, "Cable Plant Layout - Serving Area Value Engineering".

5.2 In addition to the design and installation practices as indicated in paragraph 5.1, special considerations must be given to the placement of the SAI cabinets or housings. The Serving Area Interface housing should not be located at ground level in possible high water areas. In addition, the Engineer should give consideration to accessibility to the location of the SAI housing for initial installation and for future installer activities.

5.21 The Engineer should inspect each SAI location after determining whether the SAI is to be considered as a high activity or low activity housing as indicated in paragraph 1.4 to evaluate the type of mounting that will be required for each particular SAI housing.

5.211 Considerations for the mounting of BDS-300 housings:

1. Concrete Slab (poured-in-place or pre-cast)

   (a) Where loose or fluid solid will not give a firm base

2. Crush rock or plastic pad

   (a) Where housing is located in heavy brush area (high activity housing)

   (b) Where esthetic value is demanded

   (c) Where mud conditions are prevelent (high activity housing)

3. Stake mount

   (a) Normal conditions

3. Stake Mount

   (a) Normal conditions

4. Pole Mount

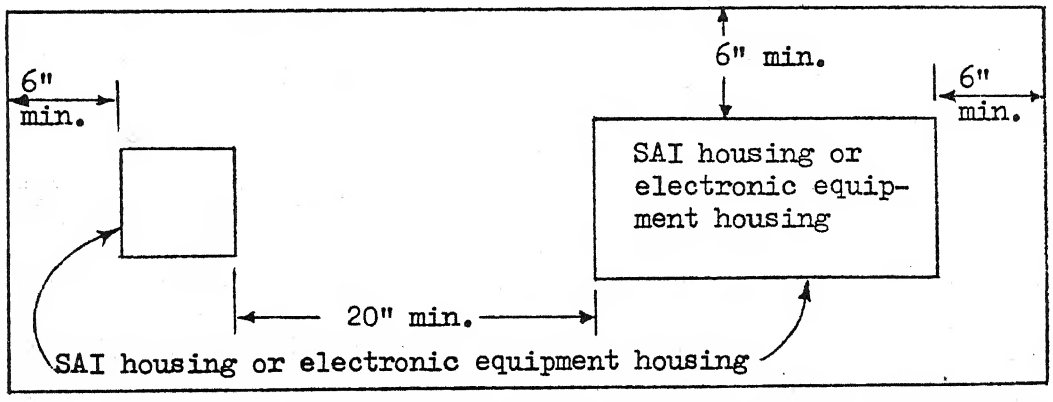
   (a) High water area

   (b) Heavy brush area

5.22 Protection should be given to all SAI housings at locations susceptible to vehicular damage. It is recommended that stub poles be used for guard purposes.

5.23 Specific installation instructions for pad or slab base preparation, slab or pad installation, and the assembly and installation of the housing shall be provided by the housing manufacturer and/or the Engineer.

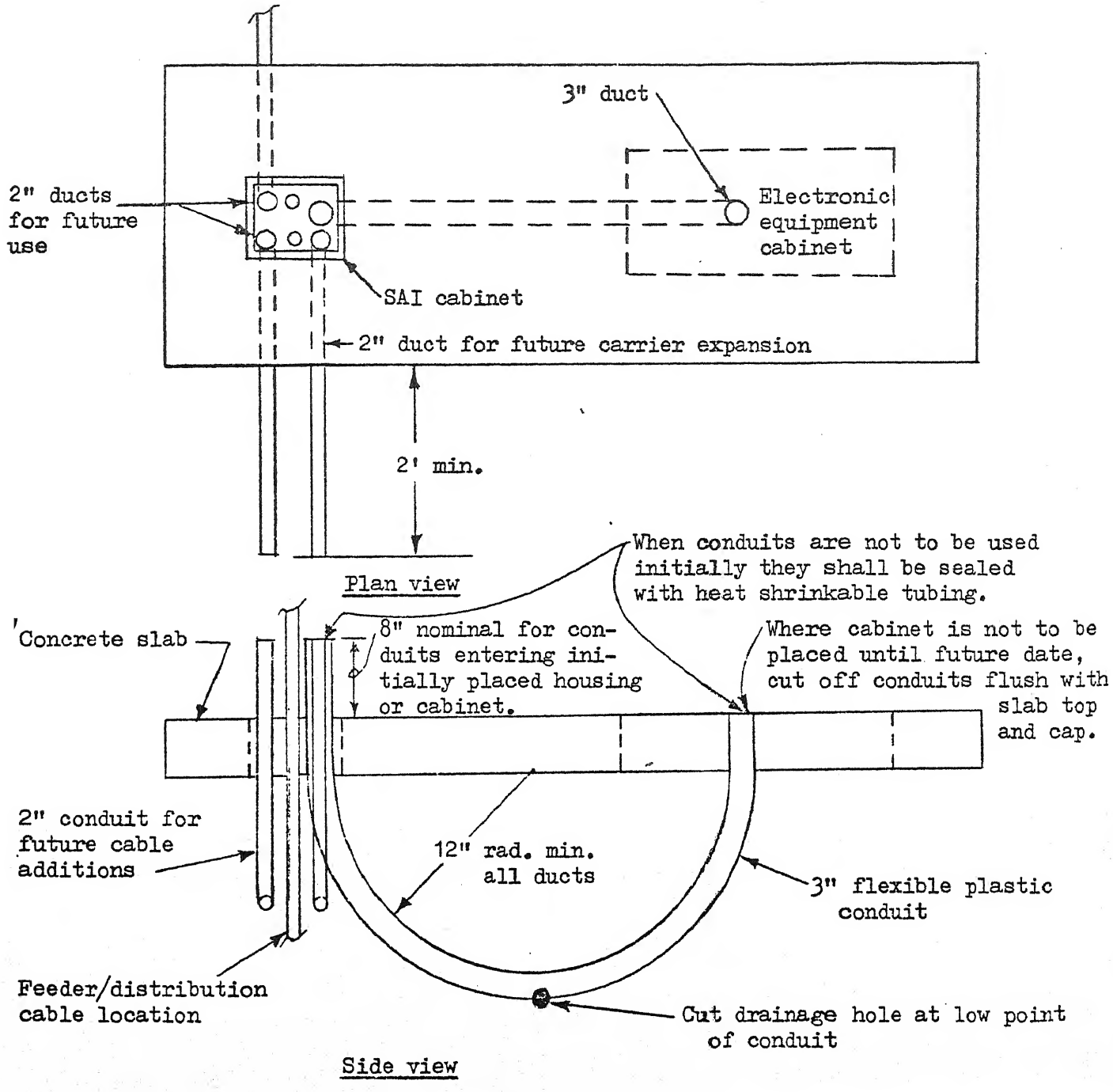
5.24 Where a slab is required for mounting both a physical SAI and electronic housing, the width, length and thickness of the slab with the necessary reinforcing, if required, should be determined from both the electronic equipment housing manufacturer and the physical SAI housing manufacturer requirements. It is necessary that the 20-inch minimum separation be maintained between the physical cabinet and the electronic cabinet to facilitate the conduit placement between the housings.



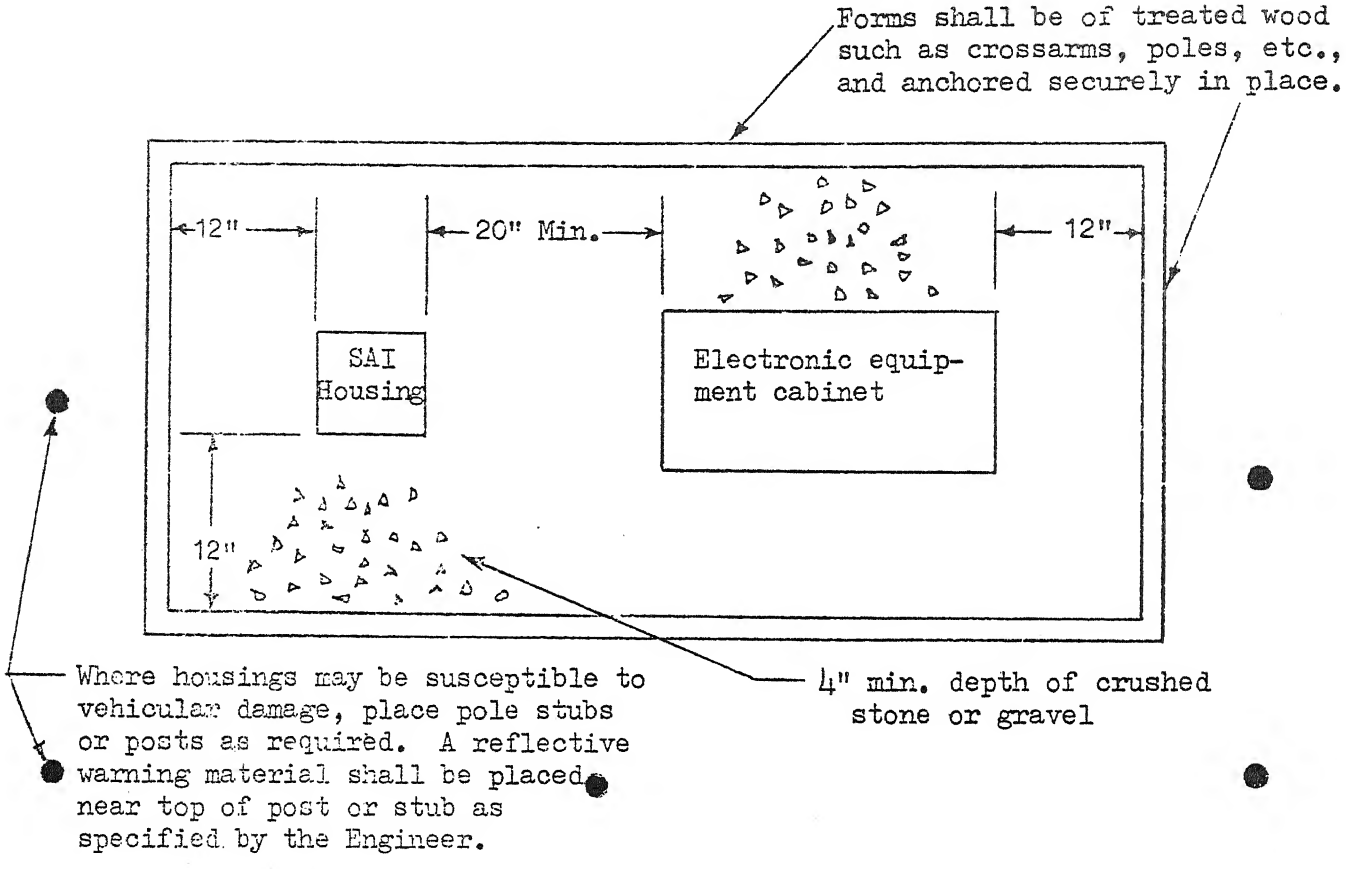
Notes: 1. Specific instructions for the preparation and construction of the slab will be provided by the SAI and electronic housing manufacturer and/or the Engineer.

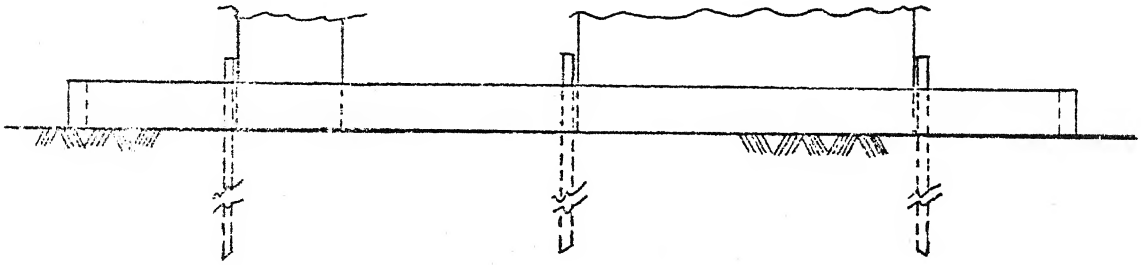
2. Where housings may be susceptible to vehicular damage, place pole stubs or posts at positions outside of the slab area as shown on Guide Drawing 1004.

5.25 Where both a physical SAI housing and an electronic cabinet are to be placed on a common slab, a 3-inch flexible conduit should be placed between the two cabinets to facilitate the placement of the electronic cable stub. In addition, two 2-inch conduits should be stubbed out from the physical SAI cabinet to both sides of the slab for future cable additions, and a spare 2-inch conduit stubbed out for possible future electronic equipment stub. A typical plan view and side view of these requirements is shown in the following drawings:


3" duct
2" ducts for future use
Electronic equipment cabinet
SAI cabinet
2" duct for future carrier expansion
2' min.
Plan view
When conduits are not to be used initially they shall be sealed with heat shrinkable tubing.
Concrete slab
8" nominal for conduits entering initially placed housing or cabinet.
Where cabinet is not to be placed until future date, cut off conduits flush with slab top and cap.
2" conduit for future cable additions
12" rad. min. all ducts
3" flexible plastic conduit
Feeder/distribution cable location
Cut drainage hole at low point of conduit
Side view

TYPICAL SAI CRUSHED STONE OR GRAVEL PAD MOUNT



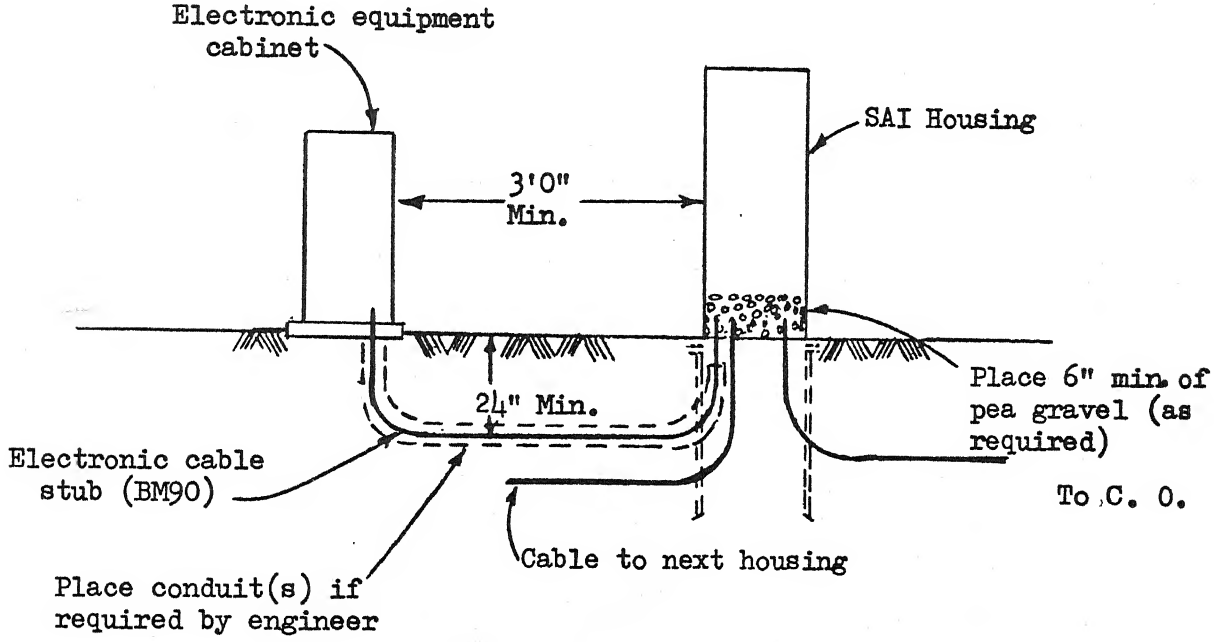


Note: Housing and/or cabinet is to be mounted in position prior to placement of crushed stone or gravel.

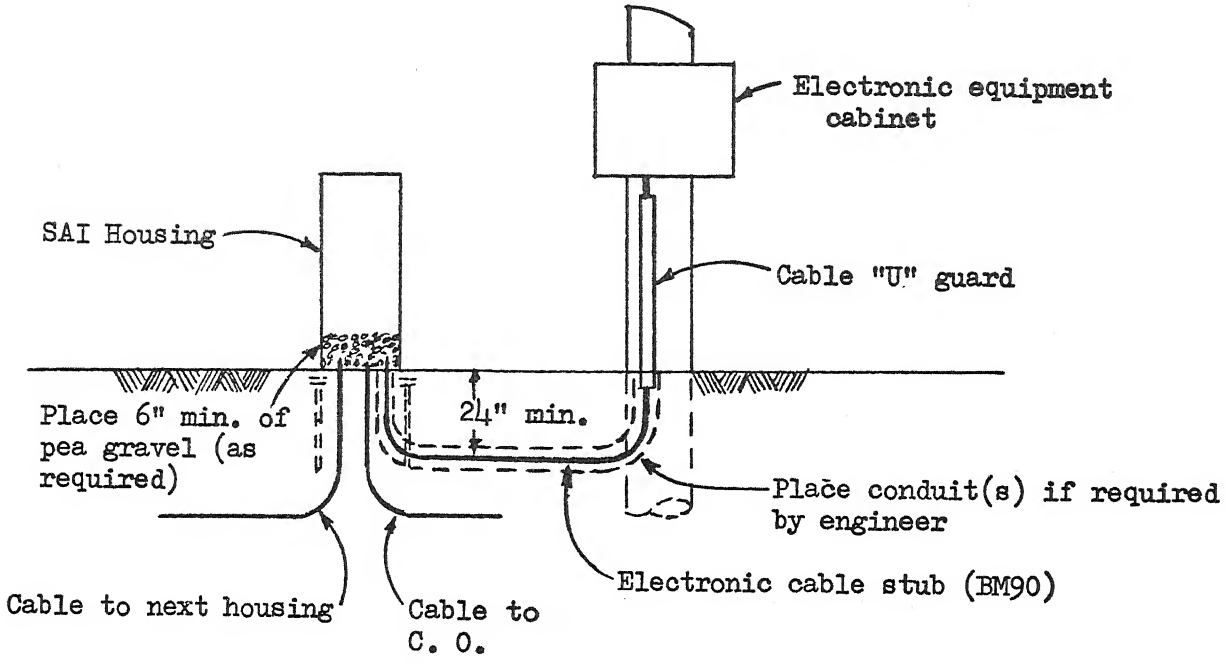
5.26 Where the SAI housings do not have the capability to provide internal electronic equipment then the Consulting Engineer should provide for both the SAI housing and electronic equipment to be placed separately.

5.261 Typical installations of various SAI and electronic equipment housings are indicated as follows:

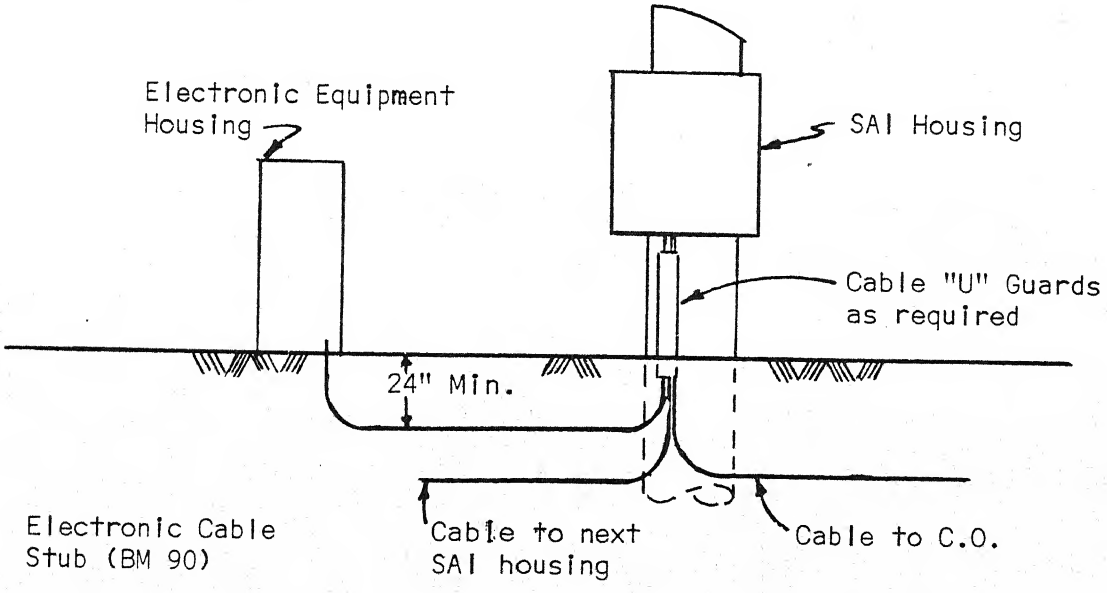
A. Typical installation of a stake mounted SAI housing with electronic cable stub to electronic housing slab mounted.



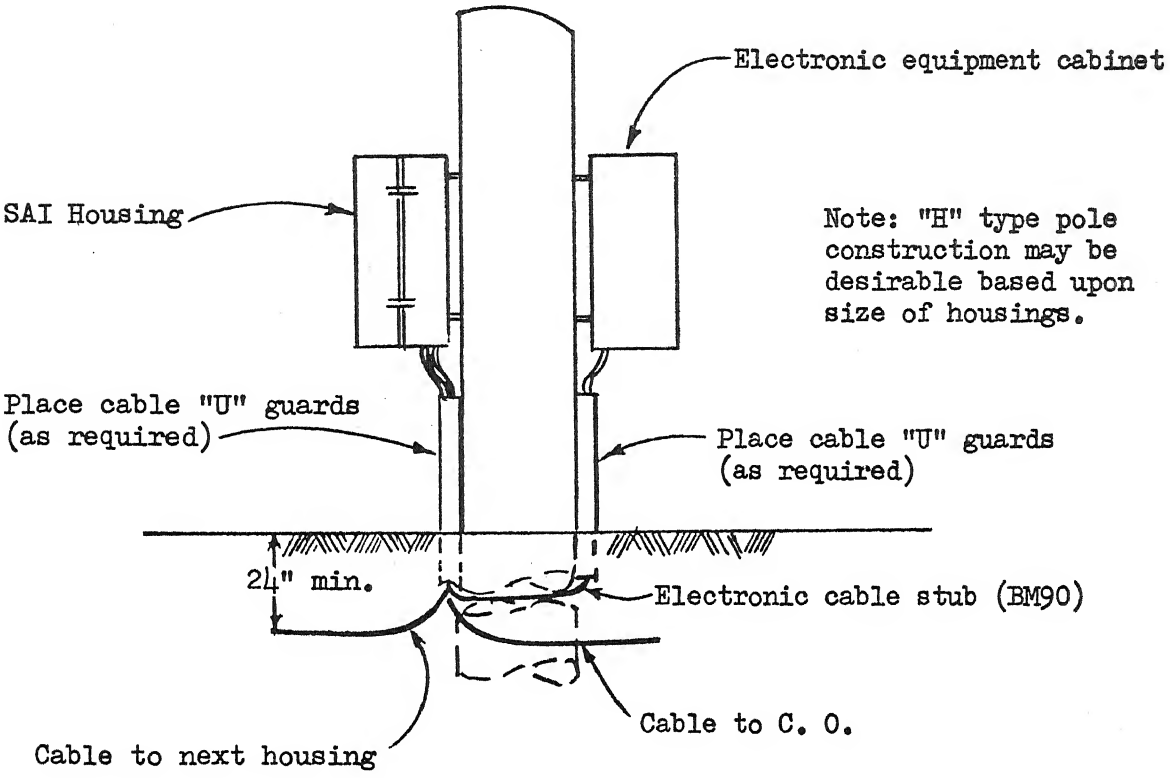
B. Typical installation of a SAI housing, stake mounted, with cable stub to electronic pole mounted equipment.



C. Typical installation of a SAI housing, pole mounted, with cable stub to electronic housing slab mounted.



D. Typical installation of a SAI housing, pole-mounted, with cable stub to electronic pole-mounted-equipment.



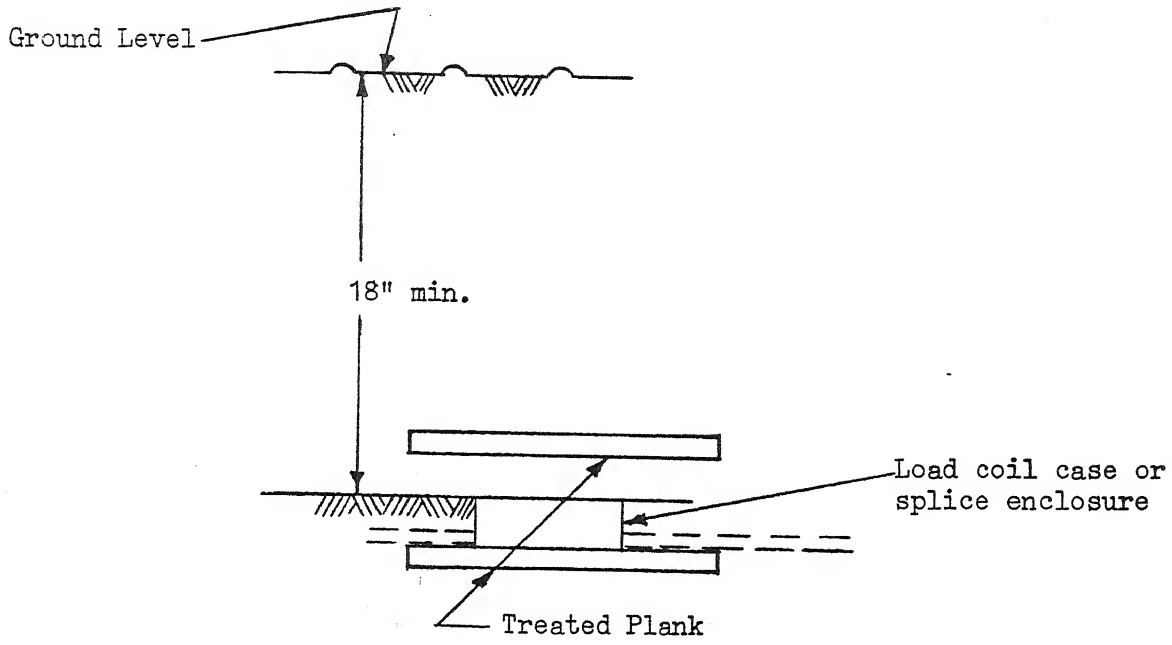
5.27 Where the bottom of the housings, when slab, pad or stake mounted, is open to ground exposure, a minimum of six inches of pea gravel should be placed.

5.28 Where non-filled type cable is installed within the housing, moisture blocks should be installed.

5.29 Specific installation instructions for the housing, stake- or pole-mounted assembly will be provided by the housing or cabinet manufacturer.

5.30 The spearate stakes of stake-mounted housings should be driven a minimum of 12-inches in undistrubed earth in a vertical position and faced in accordance with the housing manufacturer's instructions.

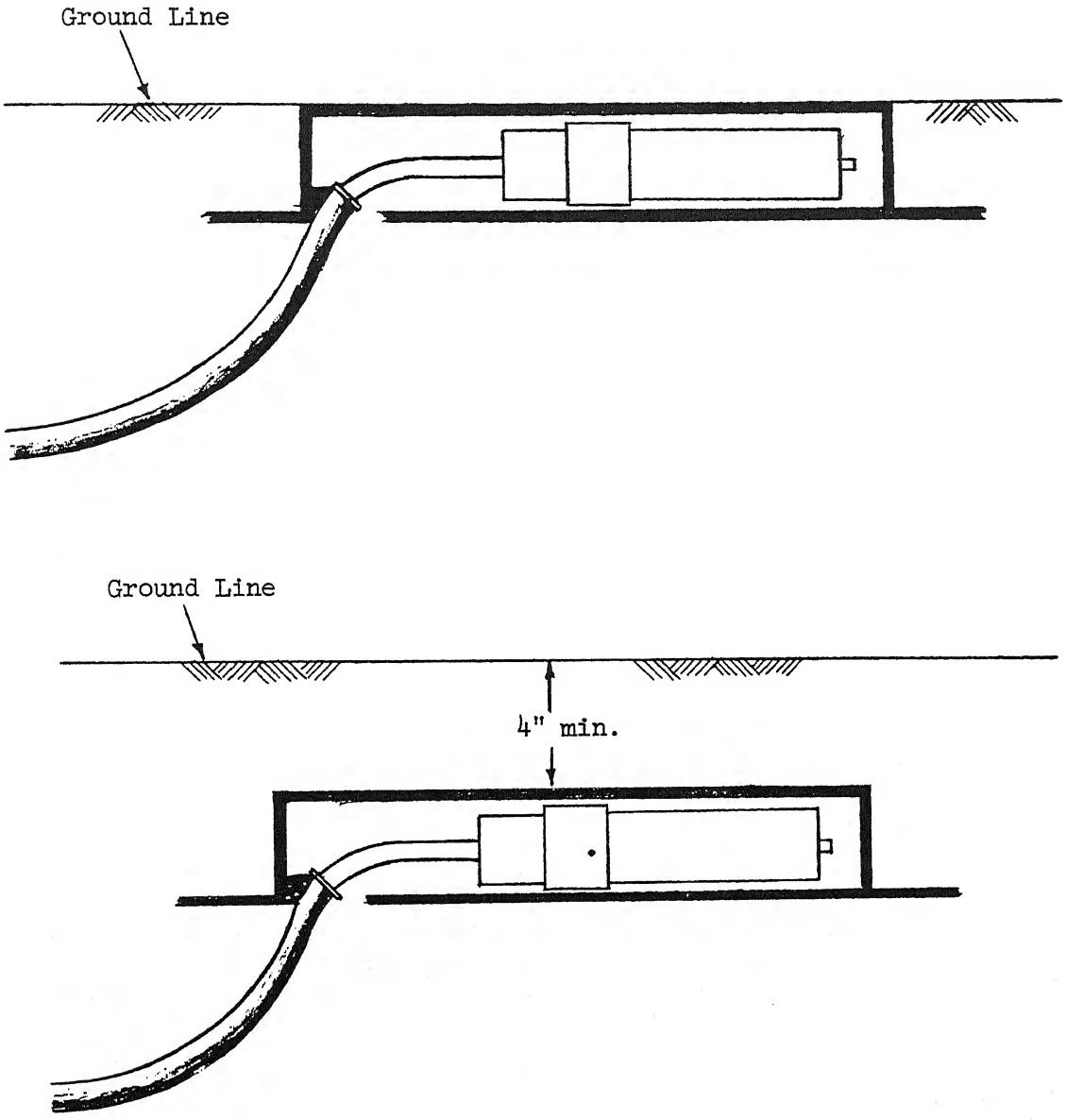
5.31 Typical installation of direct buried load coil case or buried splice enclosure.



1. Fill the trench with soil to 6 inches above top surface of load coil case or buried splice enclosure and compact soil carefully. Place treated plank over top of installed case as shown. Compact trench fill carefully.

2. Where a firm base cannot be obtained, place the load coil case or splice enclosure on a treated plank as shown.

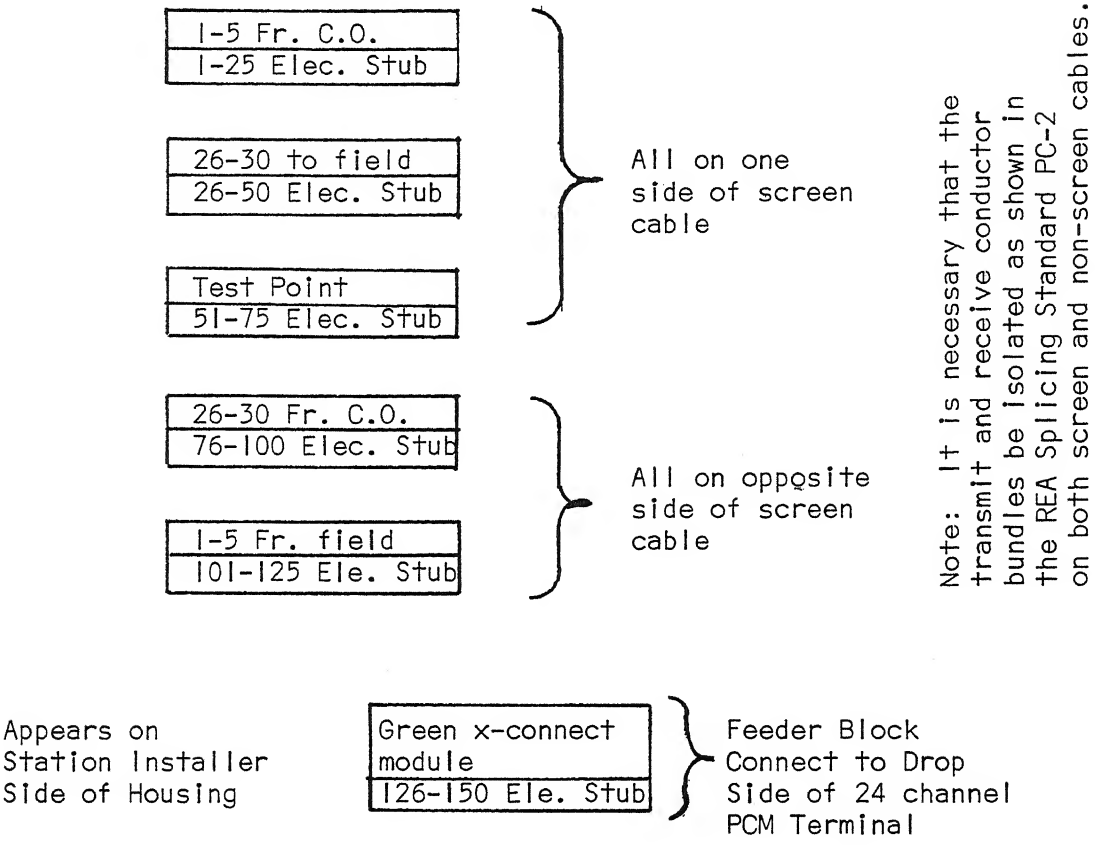
5.32 Typical installation of handhole with splice enclosure.



The installation of the handhole, cable and splice enclosure shall be in accordance with the manufacturer's instructions.

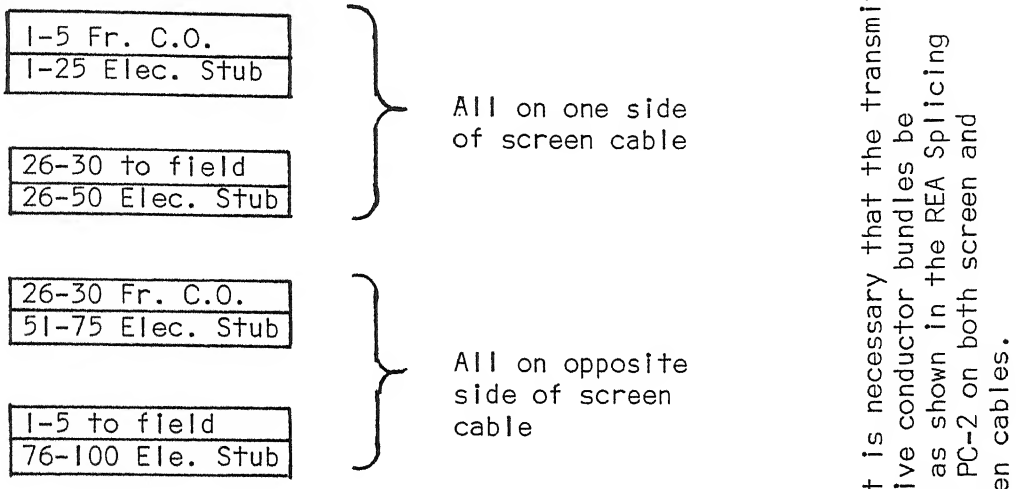
5.33 Indicated on the following sketches are typical CXR pair termination assignments on modules within SAI housings:

Typical CXR pair termination assignments on modules within SAI housings



A 50 pair cable with a 150 pair electronic screen cable stub from Electronic Equipment with one 24 channel PCM Terminal. (Same arrangement for concentrators or station carrier.)

Typical CXR pair termination assignments within SAI housings



A 50 pair screen cable with a 100 pair electronic cable stub from electronic equipment is shown.

6. BONDING AND GROUNDING

6.1 As indicated in paragraph 1.3, a function of the Serving Area Interface cabinet or housing is to provide for the application of electronic equipment. Because of transmission and protection requirements it is of the utmost importance that the bonding of cable shields be installed in accordance with the bonding connector manufacturer's instructions. In addition, only bonding connectors that are accepted by REA should be used.

6.2 Any housing or cabinet which is placed within a radius of 6 feet of a power pole must have a number 6 gauge ground wire bonded to the power ground conductor. Refer to TE&CM 816 Addendum 1, "Electrical Protection of Buried Plant" for details.

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